

# Polish Forum for Prevention Guidelines on cardiovascular diseases prevention in children and adolescents

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## INTRODUCTION

Cardiovascular diseases (CVD) are the most common cause of death in European countries. They often lead to disability and consequently to an increase in cost of health care. The main cause of CVD is atherosclerosis which may begin in childhood and remain asymptomatic for many years and which progression depends mainly on modified risk factors [1]. Although atherosclerotic complications are usually observed in adults, atherosclerosis begins in childhood and puberty, which was confirmed by autopsy studies, published at the beginning of the XXth century [2]. Recent studies based on autopsy examinations of children who died suddenly (accidents, suicides), revealed a correlation between atherosclerotic lesions in aorta or coronary arteries with known risk factors of CVD [3, 4]. In Bogalusa Heart Study as well as in Pa-

thobiological Determinants of Atherosclerosis in Youth Study (PDAY) the range of damage to the aorta and coronary vessels showed close relation to: body mass index (BMI), systolic and diastolic blood pressure, cigarette smoking, level of lipoproteins and glycated haemoglobin. Finnish studies demonstrated close relation between risk factors of CVD in childhood and an increase in common carotid artery intima-media thickness (cIMT) in adults [5].

Cultural, social and economic changes in Poland have contributed to higher prevalence of overweight and obesity also in children population [6]. Obesity has become the commonest risk factor of CVD. The old stereotypes, that excess of body weight in child favours its proper development is no longer valid. An obese child, as well as obese adult, is at high risk of hyperinsulinaemia, impaired glucose tolerance, type 2

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**Table 1.** Disease stratification by cardiovascular risk [13]

	Risk category	Rationale	Disease/condition
Tier 1	High risk	Coronary artery disease manifestation < 30 years of age Pathological and/or clinical evidence	Homozygous FH DM, type 1 Chronic kidney disease/end-stage renal disease Post-orthostatic heart transplantation KD with current coronary aneurysms
Tier 2	Moderate risk	Accelerated atherosclerosis < 30 years of age Pathophysiological evidence	Heterozygous FH KD with regressed coronary aneurysms DM, type 2 Chronic inflammatory disease
Tier 3	At risk	High-risk setting for accelerated atherosclerosis (coronary artery disease manifestation > 30 years of age) Epidemiological evidence	Post-cancer-treatment survivors Congenital heart disease KD without detected coronary involvement

FH — familial hypercholesterolaemia; DM — diabetes mellitus; KD — Kawasaki disease

diabetes mellitus, dyslipidaemia, hypertension and adverse changes in blood vessel walls [7, 8]. Obesity in the developmental age, especially in teenagers, predisposes not only to obesity in adulthood but also is a strong factor leading to metabolic syndrome [9]. Awareness of these facts should oblige health care providers to implement obesity prophylaxis [10]. It is recommended to propagate healthy lifestyle (proper nutrition, i.e. elimination of fast food and crisps, limitation of sweets, sweet drinks, and food with flavour additives as well as more physical activity). A preventive factor is also breast feeding of the neonate during first 6 months of life which lowers the risk of obesity in later life, improves lipid profile and reduces blood pressure and C-reactive protein level in children. It seems that obesity prophylaxis should be started in prenatal life through proper nutrition of pregnant woman. There are data that both increased body mass of the foetus and intrauterine growth retardation may lead to development of obesity.

American Heart Association (AHA) in 2003 and 2007 published recommendations concerning the beginning of primary prophylaxis of CVD connected with atherosclerosis in children [11, 12]. Although there are no diagrams (such as SCORE) to assess total risk in children population, the groups of increased CVD risk were indicated in these documents. In identification of high risk groups attention was paid to:

- positive family history with regard to obesity, hypertension, dyslipidaemia, diabetes mellitus and early occurrence of CVD and
- patient history with regard to the occurrence of: overweight or obesity, pre-hypertension or hypertension, diabetes mellitus, cigarette smoking and low physical activity (less than 60 minutes per day).

Screening with fasting lipid profile was recommended in children over 2 years of age with a family history positive for early CVD, dyslipidaemia and/or diabetes mellitus, in chil-

dren with unestablished family history and in children who have other risk factors of CVD. If the mean lipids level based on two fasting examinations exceeded the maximum value (for total cholesterol: 170 mg/dL, LDL-cholesterol: 110 mg/dL), it was recommended to start appropriate dietary treatment and to increase physical activity. In case of significant dyslipidaemia, especially resistant to lifestyle modification for 6 to 12 months, consideration of pharmacological treatment was recommended (after exclusion of secondary causes of dyslipidaemia, i.e. thyroid, liver or kidney diseases and diabetes mellitus).

Another document by AHA accepted by the American Academy of Paediatrics (AAP) is concerning children with high risk of CVD [13]. Experts analysed available data about early atherosclerosis and reactions to used management. Depending on pathological, clinical, pathophysiological or epidemiological evidence for the presence of early atherosclerosis a stratification protocol was established, where diseases were classified into 3 risk groups (Table 1). In the highest risk group (tier 1) are children who have pathological and/or clinical evidence to be manifested as coronary disease before 30 years of age. In this group the target level of LDL-cholesterol is  $\leq 100$  mg/dL and  $HbA_{1c} < 7\%$ . Patients in tier 1 should maintain proper body weight and blood pressure < 90 percentile. In the recommendations therapeutic lifestyle changes and specific treatment for particular diseases was presented. In children over 10 years of age with dyslipidaemia, statins were recommended as first choice drugs. In patients with hypertension, after 6 months of ineffective non-pharmacological management, treatment with angiotensin-converting enzyme inhibitor was recommended. Authors of these recommendations suggested that in the highest risk group management similar to that as in secondary prevention in adults with confirmed coronary disease should be introduced.

Educational projects involving CVD prophylaxis in children and adolescents in Poland are currently implemented by the National Program of Prophylaxis and Treatment of Cardiovascular Diseases — POLKARD and Polish Forum for Prevention [14, 15].

It should be emphasised that the present Guidelines are first such document in Poland. We hope that it will help to bring into life the motto of the European Heart Health Charter: „Every child born in the new millennium has the right to live until the age of at least 65 without suffering from avoidable cardiovascular disease” [16].

## GUIDELINES

1. **Atherosclerosis** may begin in childhood or early puberty. The course is usually slow and asymptomatic and its progression correlates with the number and intensity of the same cardiovascular disease (CVD) risk factors as in adults: body mass index (BMI), systolic and diastolic blood pressure, concentration of the total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), triglycerides (TG) and active or passive cigarette smoking.
2. **The greatest risk of** early development of CVD is observed in children and adolescents with familial hypercholesterolaemia, diabetes mellitus, chronic kidney disease, Kawasaki disease, chronic inflammatory diseases, and congenital heart diseases and after heart transplantation and cancer treatment. For each of these diseases CVD events may occur in the first two decades of life.
3. **The most common risk factor of CVD**, i.e. overweight and obesity, in the Polish paediatric population accounts for 7 to 21% depending on the region, patient's age and criteria for diagnosis; in the recent years an increase in the prevalence of this risk factor has been observed.
4. **The prophylaxis of CVD** in children and adolescents should involve:
  - a. health education directed at the whole population,
  - b. identification of groups at increased risk,
  - c. intervention in the groups of increased risk.
5. **Recommendations for all children and adolescents include:**
  - a. **a proper diet**, to enable normal growth and development of the child and to maintain ideal body weight, blood pressure and lipid profile. Calorie intake should be adjusted to meet demand. Consumption of vegetables and fruit, whole grains, dairy products, fish, nuts, poultry and lean meat is recommended. Fat intake should be unrestricted up to the age of 2 years. Afterwards it is recommended to limit foods high in: saturated fats < 10% of calories per day, *trans*-fatty acids < 1% of calories per day, salt intake < 6 g per day and monosaccharides,
  - b. **avoidance of smoking** and staying away from places where people smoke,
  - c. **increase in physical activity** to at least 60 minutes per day and limitation of time spending in front of a screen (television, DVD, computer) to at most 2 hours per day. Parents, teachers, doctors and other health care workers must participate in healthy lifestyle promotion.
6. **Identification of groups at high risk of CVD** is based on:
  - a. a family history to establish premature (before 55 years of age) development of CVD and/or risk factors of CVD in the closest relatives (severe hypercholesterolaemia, hypertension, metabolic syndrome, diabetes),
  - b. regular assessment of weight, height and BMI,
  - c. measurement of blood pressure at least once a year in children over 3 years of age, using appropriate cuff size,
  - d. evaluation of a lipid profile in children over 2 years of age with positive family history for dyslipidaemia or early CVD and in children in whom other risk factors are present or family history is unknown. If lipid profile is normal it is recommended to repeat the test every 3–5 years
  - e. evaluation of glucose level after 2 hours in oral glucose tolerance test in obese children every 2 years,
  - f. regular (at least once a year) estimation of passive or active cigarette smoking,
  - g. regular (at least once a year) evaluation of physical activity.
7. **The aim of intervention** is to eliminate or reduce negative effects of identified risk factors. In this intervention a close cooperation between doctors and parents as well as acceptance from a child are necessary. CVD prevention should begin early in the developmental age.
8. **The target levels of risk factors in children and adolescents:**
  - a. LDL-C < 130 mg/dL (if possible < 110 mg/dL) and < 100 mg/dL in people at the highest risk of CVD (children with familial hypercholesterolaemia, diabetes mellitus, chronic kidney disease, after heart transplantation and with Kawasaki disease with coronary artery aneurysms),
  - b. TG < 150 mg/dL,
  - c. HDL-C > 40 mg/dL,
  - d. blood pressure < 95 percentile for age, sex and height or < 90 percentile for age, sex and height in case of co-existence of risk factors of CVD as well as in patients at the highest risk of CVD (see 8a),
  - e. BMI < 90 percentile for age and sex,
  - f. glucose levels as in adults (see Polish Forum for Prevention Guidelines for diabetes mellitus),  $HbA_{1c}$  < 6.5%. In case of risk factor's levels above the targets, the first step is to recommend a change in lifestyle. If no effect is observed, secondary causes of disorders should be looked for and then pharmacological treatment should be considered.

## 9. Non-pharmacological treatment:

### a. diet:

- limited intake of:
  - I. saturated fats (< 7% calories), *trans*-fatty acids < 1% calories and total cholesterol (< 300 mg per day) in case of elevated level of LDL-cholesterol,
  - II. monosaccharides if there is hypertriglyceridaemia,
  - III. salt.
- alcohol abstinence,
- increased consumption of vegetables and fruit.

Collaboration with a trained dietician is recommended.

### b. increased physical activity

- ### c. weight reduction.
- For overweight or obese children a weight management program should be initiated and directed at all family members who are overweight or obese,

- ### d. complete cessation of smoking
- for children and parents who smoke. All tobacco users should be advised to quit smoking and to stay away from places where cigarettes are smoked.

## 10. Pharmacological treatment.

If change of lifestyle does not bring adequate effects after 6–12 months, pharmacological treatment should be considered:

### a. of hypercholesterolaemia if:

- LDL-C > 190 mg/dL in children without risk factors,
  - LDL-C > 160 mg/dL in children with a family history positive for early CVD or  $\geq 2$  other risk factors,
  - LDL-C > 130 mg/dL in patients with diabetes mellitus.
- The drug of choice is statin (for boys  $\geq 10$  of age and girls after puberty). A consultation with the centre experienced in dyslipidaemia treatment is recommended.

- ### b. of hypertriglyceridaemia, when fasting TG > 700 mg/dL
- to diminish the risk of acute pancreatitis. Fibrates or nicotinic acid (in children  $\geq 10$  of age) and omega-3 fatty acids are used. A consultation with the centre experienced in dyslipidaemia treatment is recommended,

- ### c. of hypertension.
- The indication to begin pharmacotherapy, regardless of lifestyle changes, is symptomatic or secondary hypertension, evidence of organ damages (heart, kidneys, retina) and accompanying diabetes mellitus or chronic kidney disease.

**Patients with the highest risk of CVD development require individual therapeutic approach.**

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